21. (Amended) A control apparatus for the reduction of load cycle oscillations in the drive train of a motor vehicle, said control apparatus having a control program with a program code for carrying out the following steps:

detecting a change in an available torque in the drive train of a motor vehicle, said change causing a load cycle oscillation having a period,

determining the period of the load cycle oscillation, and

during the commencement of the change in available torque, applying at least one torque pulse which causes an oscillation in phase opposition to the load cycle oscillation, said torque pulse having a duration which is about half the period of the load cycle oscillation.

Cancel claims 6 and 20.

REMARKS

The specification has been amended at page 12 to include material from GB 2,305,743. A declaration stating that the amendatory material consists of the same material incorporated by reference to that application accompanies this amendment.

Proposed changes to Figures 1, 2a, 2b, 9, 10a, 10b, 16a and 16b are marked in red on the copies attached. The logic device referred to in claim 3 is part of the central processor 10 now shown in Figure 1 and described at page 12. The logic device (logical means) is also described at page 6 of the application as filed.

Claims 1, 16, 19 and 21 stand rejected under 35 U.S.C. §112, second paragraph based on the language "determining the period of the load cycle oscillation". The examiner states

that this implies that the period is measured, which would be impossible since a torque pulse in opposition to the disturbance is applied at the commencement of the change in available torque. This rejection is traversed for the reasons following.

First of all, the language "determining" does not imply that the period is measured. "Determine" is defined by the American Heritage Dictionary as follows: "To establish or ascertain definitely, as after consideration, investigation, or calculation". This has been correctly surmised by the examiner where he states that "The period of the load cycle oscillation is predicted or estimated or looked up in a table".

GB 2,305,743 is not explicit on this point, but it will be apparent from pages 10-12 taken with Figures 4a and 4b that the period T is determined for a given set of conditions without generating any counteracting torque. The periods for various sets of vehicle conditions are apparently stored in the central processor 42, so that when the conditions occur again the period of the load change vibration (load cycle oscillation) can be accurately predicted or determined. The many inputs mentioned at page 10 of GB '743, and now mentioned at page 12 of the present application, would be sufficient to generate the plots of Figures 4a and 4b of GB '743 for a given set of conditions and thereby determine the period T.

Claims 1, 16, and 21 also stand rejected under 35 U.S.C. §112, second paragraph, based on the language "at the commencement of the change in available torque". The examiner states that there would be a finite amount of time between the change in torque and the application of a torque pulse. However true this may be, the finite time between sensing the commencement of a torque change and the application of a torque pulse can be quite small. As such the pulse is

applied "during" the commencement of the change in available torque. The claims have been amended accordingly, but no change in scope is intended. Note that the American Heritage Dictionary defines "at" as "In the duration of; during: *at night*".

The rejection under 35 U.S.C. §112, first paragraph, is believed to be overcome by the amendment to include disclosure taken from GB '743.

Claims 1-5, 7-10, 12, 13, and 16-21 stand rejected as obvious over Weimer et al. 6,373,205 in view of Masberg et al. 6,405,701 and Lorenz et al. 6,336,070. This rejection is traversed for the reasons following.

Weimer and Masberg both relate to actively reducing on-going rotational irregularities (vibrations) in a drive train. Weimer represents an improvement over Masberg and discusses Masberg as relevant prior art at column 1, lines 12-56.

Referring to Figures 1A-1C in Masberg, Figure 1A illustrates the vibrations present in a crankshaft, which occur as speed fluctuations about a mean speed (here 3000 RPM). The speed n has the same period of fluctuation as torque M_v and is thus illustrated as a single line. In order to counteract this, a motor generates a torque M_e as illustrated in Figure 1B, which is superimposed on the torque M_v.

Note that the engine vibrations illustrated in Figure 1A of Masberg occur during steady state operation of the engine and have nothing to do with a load cycle oscillation (load change vibration) which occurs as a result of a change in torque. As such, the offsetting torque of Figure 1B is an ongoing torque having the same period, but is out of phase.

As correctly recognized by the examiner, Weimer is from the same field of endeavor as Masberg. However both Weimer and Masberg are from a very different field than the present invention, which relates to reducing load cycle oscillations which occur during a change in torque.

Weimer augments the counter-torque produced by an electric machine with oscillations generated by a deflection mass arrangement, in order to reduce the energy consumed by the electric machine.

Lorenz et al. relates to a control system for a hybrid vehicle having an engine and an electric machine which either augments engine torque or diminishes it to produce electricity. While it is questionable whether this is in the same field of endeavor as Masberg and Weimer, it is not in the same field of endeavor as the present invention.

The examiner cites *In re Aller*, 105 USPQ 233 (CCPA 1955) for the proposition that it is not inventive to discover the optimum or workable ranges by routine experimentation where the general conditions of a claim are disclosed in the prior art. However true this may be, the general conditions of applicant's claims are not disclosed in the prior art. The prior art cited by the examiner addresses a totally different problem and explicitly discloses generating a torque with exactly the some period as the ongoing engine vibrations. It in no way suggests applying a torque pulse having a duration which is half the determined period of a load cycle oscillation.

The allowability of dependent claims 6, 11, 14 and 20 is noted with appreciation. However it is felt that the independent claims are not only definite but patentably distinguishable from the art of record.

Accordingly, withdrawal of the rejection and early allowance are solicited. Should any objections remain, a call to the undersigned is requested.

It is believed that no fees or charges are required at this time in connection with the present application; however, if any fees or charges are required at this time, they may be charged to

our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
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Dated: January 29, 2003

AMENDMENTS TO THE SPECIFICATION AND CLAIMS SHOWING CHANGES

IN THE SPECIFICATION:

Please replace the paragraph beginning at page 12, line 3, with the following rewritten paragraph:

Figures 4a and 4b, then, show the behavior of the rotational speeds and torques in the same load cycle, but with the method according to the invention being carried out. In this case, an additional torque pulse I is applied by the electric motor 6 (figure 1) simultaneously with the change in the engine torque M. The additional torque pulse has a value of -50 Nm, that is to say it is half the magnitude of the average engine torque M applied and is directed opposite to the latter. The additional torque pulse I has a duration which corresponds to half the period of the load cycle oscillation. For controlling the pulse, for example, torque information from the engine electronics is used. Alternatively, the control of the pulse may also be derived from the change in rotational speed. The period of the load cycle oscillation <u>(also referred to as load change vibration)</u> may be determined, for example, from vehicle condition data <u>such as the throttle position, the engine speed, the road speed, the clutch state, and the engaged gear. A central processor determines the oscillation period based on this information</u>. This is described, for example, in GB 2,305,743 initially mentioned, to which express reference is made [and the content of which is incorporated herein by reference].

IN THE CLAIMS:

Claims 1, 4, 5, 16 and 21 are amended as follows:

1. (Amended) A method for the reduction of load cycle oscillations in the drive train of a motor vehicle, the method comprising:

detecting a change in an available torque in the drive train of a motor vehicle, said change causing a load cycle oscillation having a period,

determining the period of the load cycle oscillation, and

[at] during the commencement of the change in available torque, applying at least one torque pulse which causes an oscillation in phase opposition to the load cycle oscillation, wherein said torque pulse is produced by a motor, said torque pulse having a duration which is about half the period of the load cycle oscillation.

4. (Amended) A method as in claim 1 wherein said torque pulse is [applied] produced by an electric motor.

5. (Amended) A method as in claim 1 wherein said torque pulse is [applied] produced by a starter motor of the vehicle.

16. (Amended) An apparatus for the reduction of load cycle oscillations in the drive train of a motor vehicle, the apparatus comprising:

means for detecting a change in an available torque in the drive train of a motor vehicle, said change causing a load cycle oscillation having a period,

means for determining the period of the load cycle oscillation,

means for generating a torque pulse coupled to the drive train, and

logic means for triggering the torque pulse [at] during the commencing of a load cycle oscillation, said logic means controlling said torque pulse so that it lasts half the period of the load cycle oscillation and is in phase opposition to the load cycle oscillation.

21. (Amended) A control apparatus for the reduction of load cycle oscillations in the drive train of a motor vehicle, said control apparatus having a control program with a program [codefor] code for carrying out the following steps:

detecting a change in an available torque in the drive train of a motor vehicle, said change causing a load cycle oscillation having a period,

determining the period of the load cycle oscillation, and

[at] during the commencement of the change in available torque, applying at least one torque pulse which causes an oscillation in phase opposition to the load cycle oscillation, said torque pulse having a duration which is about half the period of the load cycle oscillation.